REMARKS

This Amendment is filed in response to the Office Action dated March 18, 2008. For the following reasons this application should be allowed and the case passed to issue. No new matter is introduced by this Amendment. The amendments to claims 1, 4, and 16 are supported by canceled claim 2 and the specification at paragraphs [0010] and [0022].

Claims 1, 4-9, 16-22, and 25 are pending in this application. Claims 10, 12-15, 23, and 24 have been allowed. Claims 1, 2, 4-9, 16-22, and 25 have been rejected. Claims 1, 4, 5, and 16 have been amended in this response. Claims 2, 10, 12-15, 23, and 24 have been canceled in this response. Claims 3 and 11 were previously canceled.

Allowable Subject Matter

Claims 10, 12-15, 23, and 24 have been allowed.

Applicants greatly appreciate the indication of allowed claims. Claims 10, 12-15, 23, and 24 have been canceled without prejudice to filing in a subsequent continuation application.

Claim Rejections Under 35 U.S.C. §§ 102/103

Claims 1, 2, 4-6, 8, 9, 16-19, 21, 22, and 25 were rejected under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over Koike (JP 07-220759).

Claims 1, 2, 4-6, 9, 16-19, 21, 22, and 25 were rejected under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over Delnick (US 5,948,464).

Claims 1, 2, 4, 8, and 9 were rejected under 35 U.S.C. § 103(a) as obvious over Takata et al. (US 6,638,988).

These rejections are traversed, and reconsideration and withdrawal thereof respectfully requested. The following is a comparison between the invention, as claimed, and the cited prior art.

An aspect of the invention, per claim 1, is a secondary battery comprising: a positive electrode; a negative electrode; a porous electron-insulating layer adhered to a surface of at least one selected from the group consisting of the positive electrode and the negative electrode; and an electrolyte. The porous electron-insulating layer comprises a particulate filler and a resin binder. The particulate filler substantially comprises an indefinite-shape particle which has the shape of dendrites, grape clusters, or coral. The shape has a neck.

Another aspect of the invention, per claim 16, is a secondary battery comprising: a positive electrode; a negative electrode; a porous electron-insulating layer adhered to a surface of at least one selected from the group consisting of the positive electrode and the negative electrode; and an electrolyte. The porous electron-insulating layer comprises a particulate filler and a resin binder. The particulate filler substantially comprises indefinite-shape particles, wherein the indefinite-shape particles are polycrystalline particles comprising a plurality of single crystalline particles that are diffusion bonded to each other. A neck is formed between at least a pair of the single crystalline particles. The neck comprises the same material as the single crystalline particles.

The present claims are not anticipated by or obvious in view of Koike, Delnick, and Takata et al. because Koike, Delnick, and Takata et al. do not disclose or suggest that the particulate filler substantially comprise an indefinite-shape particle which has the shape of dendrites, grape clusters, or coral, the shape having a neck, as required by claim 1; and the indefinite-shape particles are polycrystalline particles comprising a plurality of single crystalline

particles that are diffusion bonded to each other, and a neck is formed between at least a pair of the single crystalline particles, the neck comprising the same material as the single crystalline particles, as required by claim 16.

Secondary batteries comprising a porous electron-insulating layer according to embodiments of the present invention have improved charge/discharge characteristics at high rate charge/discharge and low temperature charge/discharge. Porous electron-insulating layers formed using spherical or substantially spherical particles tend to form higher-density, lower-porosity layers (specification at paragraph [0006]). On the other hand, porous electron-insulating layers comprising indefinite shape particles do not form layers as dense as substantially spherical particles because of the complicated shapes of the indefinite-shape particles (specification at paragraphs [0015] and [0016]). Thus, porous electron-insulating layers with higher porosity are formed providing a significant improvement in high-rate and low-temperature charge/discharge properties (specification at paragraph [0015]). The indefinite-shape particles according to the present invention are not easily disintegrated into independent primary particles upon application of a shearing force thereto or mixing in a slurry or solution. Whereas, particles that are merely agglomerated would become separated into independent particles by the application of shearing force, and particles that are held together by a binder could become separated if dissolved in a solution or mixed in a slurry.

As clearly illustrated in Figs. 1 and 2, Koike discloses that the particles are either spherical or substantially spherical. The Examiner asserted, however, that because Koike discloses a binder (PVdF) mixed with alumina particles, indefinite-shape particles would inherently or naturally form. The Examiner averred that the silica filler and resin binder of Delnick form indefinite shape particles. As regards Takata et al., the Examiner opined that

organic and inorganic fillers are art recognized equivalents and that when a mixture of organic fillers and resin binders are kneaded in a kneader, the organic filler particles will naturally aggregate and form indefinite-shape particles comprising shapes of dendrites, grape clusters, or coral.

The Examiner's conclusion that organic and inorganic fillers are art-recognized equivalents is traversed. In order to rely on equivalence as a rationale supporting an obviousness rejection, the equivalency must be recognized in the prior art, and cannot be based on applicant's disclosure or the mere fact that the components at issue are functional or mechanical equivalents. *In re Ruff*, 256 F.2d 590, 118 USPQ 340 (CCPA 1958). For example, organic and inorganic fillers have widely different operating temperatures. Many common organic fillers decompose at temperatures much lower than the inorganic filler melting points. Thus, it is clear that inorganic fillers and organic fillers are not art recognized equivalents.

The Examiner maintains that Applicants have not refuted the Examiner's position that Takata clearly discloses organic fillers and inorganic fillers as being equivalents and the interchangeability of the two types of fillers. The Examiner, however, has incorrectly placed the burden of refuting that inorganic and organic fillers are equivalents on Applicants. It is the Examiner that has the burden of establishing that organic and inorganic fillers are art recognized equivalents, and the Examiner has not done so. A mere disclosure of organic and inorganic fillers in the same reference does not establish that organic and inorganic fillers are art recognized equivalents. There are many thousands of different types of organic and inorganic compounds, with very different properties, which can be used as a filler. There is no suggestion in the cited references that all organic and inorganic fillers are art recognized equivalents. Furthermore, under abuse conditions, such as a short-circuit by nail puncture, the temperature of

a battery can rapidly increase causing an organic filler to decompose in a porous electron-insulating layer leading to a catastrophic battery failure. Whereas, an inorganic filler in a porous electron-insulating layer would maintain its structural integrity despite the temperature rise due to a nail puncture short circuit and prevent catastrophic battery failure.

The Examiner alleged that claim 16 does not specify to what extent the particles are bound by a diffusion bonding process, and considered particles that touch each other without a binder as reading on diffusion bonded to each other.

Contrary to the Examiner's position, diffusion bonding has an art recognized definition, which precludes particles that merely touch each other from reading on diffusion bonded particles. As defined in the attached printout from http://www.msm.cam.ac.uk/phase-trans/2005/Amir/bond.html:

> Diffusion bonding of materials in the solid state is a process for making a monolithic joint through the formation of bonds at atomic level, as a result of closure of the mating surfaces due to the local plastic deformation at elevated temperature which aids interdiffusion at the surface layers of the materials being joined.

Clearly, none of the cited references disclose the indefinite-shape particles, wherein the indefinite-shape particles are polycrystalline particles comprising a plurality of single crystalline particles that are diffusion bonded to each other and a neck is formed between at least a pair of the single crystalline particles, the neck comprising the same material as the single crystalline particles, as required by claim 16.

As regards the Examiner's contention that binder joining round particles forms indefinite-shape particles, even if it is assumed that the binder joins the round particles of Koike together to form indefinite-shape particles, Koike does not disclose or suggest the particulate filler substantially comprising indefinite-shape particles which have the shape of dendrites, grape

clusters, or coral, **the shape having a neck,** as required by claim 1; and the indefinite-shape particles are polycrystalline particles comprising a **plurality of single crystalline particles that are diffusion bonded to each other, and a neck is formed between at least a pair of the single crystalline particles, the neck comprising the same material as the single crystalline particles**, as required by claim 16. Koike does not suggest indefinite-shape particles having a neck, bonding portions of primary particles and forming a neck between at least a pair of the primary particles, the neck comprising the same material as the primary particles, and a plurality of single crystalline particles that are diffusion bonded to each other.

Likewise, Delnick discloses a binder joining round filler particles and does not disclose or suggest the particulate filler substantially comprising indefinite shape particles which have the shape of dendrites, grape clusters, or coral, **the shape having a neck,** as required by claim 1; and the indefinite-shape particles are **polycrystalline particles comprising a plurality of single crystalline particles that are diffusion bonded to each other, and a neck is formed between at least a pair of the single crystalline particles, the neck comprising the same material as the single crystalline particles**, as required by claim 16. Delnick does not suggest indefinite-shape particles having a neck, bonding portions of primary particles and forming a neck between at least a pair of the primary particles, the neck comprising the same material as the primary particles, and a plurality of single crystalline particles that are diffusion bonded to each other.

Even if it is assumed that the mixture of organic fillers and resin binder joins the organic filler particles of Takata et al. together to form indefinite shape particles, Takata et al. do not disclose or suggest the particulate filler substantially comprising indefinite-shape particles which have the shape of dendrites, grape clusters, or coral**, the shape having a neck**, as required by claim 1; and the indefinite-shape particles are **polycrystalline particles comprising a plurality**

of single crystalline particles that are diffusion bonded to each other, and a neck is formed between at least a pair of the single crystalline particles, the neck comprising the same material as the single crystalline particles, as required by claim 16. Takata et al. do not suggest indefinite-shape particles having a neck, bonding portions of primary particles and forming a neck between at least a pair of the primary particles, the neck comprising the same material as the primary particles, and a plurality of single crystalline particles that are diffusion bonded to each other.

The factual determination of lack of novelty under 35 U.S.C. § 102 requires the disclosure in a single reference of each element of a claimed invention. *Helifix Ltd. v. Blok-Lok Ltd.*, 208 F.3d 1339, 54 USPQ2d 1299 (Fed. Cir. 2000); *Electro Medical Systems S.A. v. Cooper Life Sciences, Inc.*, 34 F.3d 1048, 32 USPQ2d 1017 (Fed. Cir. 1994); *Hoover Group, Inc. v. Custom Metalcraft, Inc.*, 66 F.3d 399, 36 USPQ2d 1101 (Fed. Cir. 1995); *Minnesota Mining & Manufacturing Co. v. Johnson & Johnson Orthopaedics, Inc.*, 976 F.2d 1559, 24 USPQ2d 1321 (Fed. Cir. 1992); *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051 (Fed. Cir. 1987). Because Koike, Delnick, and Takata et al. do not disclose the particulate filler substantially comprising indefinite shape particles which have the shape of dendrites, grape clusters, or coral, the shape having a neck, as required by claim 1; and the indefinite-shape particles are polycrystalline particles comprising a plurality of single crystalline particles that are diffusion bonded to each other, and a neck is formed between at least a pair of the single crystalline particles, the neck comprising the same material as the single crystalline particles as required by claim 16, Koike, Delnick, and Takata et al. do not anticipate claims 1 and 16.

Obviousness can be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do

so found either explicitly or implicitly in the references themselves or in the knowledge readily available to one of ordinary skill in the art. *In re Kotzab*, 217 F.3d 1365, 1370 55 USPQ2d 1313, 1317 (Fed. Cir. 2000); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992); *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). There is no suggestion in Koike, Delnick, or Takata et al. to modify the Koike, Delnick, or Takata et al. batteries so that the particulate filler substantially comprising indefinite-shape particles which have the shape of dendrites, grape clusters, or coral, the shape having a neck, as required by claim 1; and the indefinite-shape particles are polycrystalline particles comprising a plurality of single crystalline particles that are diffusion bonded to each other, and a neck is formed between at least a pair of the single crystalline particles, the neck comprising the same material as the single crystalline particles, as required by claim 16.

The only teaching of the claimed secondary batteries is found in Applicants' disclosure. However, the teaching or suggestion to make a claimed combination and the reasonable expectation of success must not be based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Claims 7 and 20 were rejected under 35 U.S.C. § 103(a) as obvious over Koike in view of Waterhouse (U.S. Pat. No. 4,363,856).

Claims 7 and 20 were rejected under 35 U.S.C. § 103(a) as obvious over Delnick in view of Waterhouse.

Claim 7 was rejected under 35 U.S.C. § 103(a) as obvious over Takata et al. in view of Waterhouse.

These rejections are traversed, and reconsideration and withdrawal thereof respectfully requested.

The combination of Koike, Delnick, or Takata et al. and Waterhouse does not suggest the claimed secondary battery because Waterhouse does not cure the deficiencies of Koike, Takata, and Takata et al. Waterhouse does not suggest that the particulate filler substantially comprising the indefinite shape particles comprising indefinite-shape particles which have the shape of dendrites, grape clusters, or coral, the shape having a neck, as required by claim 1; and the indefinite-shape particles are polycrystalline particles comprising a plurality of single crystalline particles that are diffusion bonded to each other, and a neck is formed between at least a pair of the single crystalline particles, the neck comprising the same material as the single crystalline particles, as required by claim 16.

The dependent claims are allowable for at least the same reasons as the independent claims from which they depend, and further distinguish the claimed secondary batteries.

In view of the above amendments and remarks, Applicants submit that this application should be allowed and the case passed to issue. If there are any questions regarding this Amendment or the application in general, a telephone call to the undersigned would be appreciated to expedite the prosecution of the application.

To the extent necessary, a petition for an extension of time under 37 C.F.R. § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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